CLAIMS

1. A microfeature workpiece holder adapted to hold a plurality of microfeature workpieces for chemical processing, comprising:

   a longitudinally extending member having a plurality of workpiece supports spaced longitudinally along a length of the longitudinally extending member, the workpiece supports being adapted to support the plurality of microfeature workpieces in a spaced-apart relationship for processing; and

   a longitudinally extending gas delivery conduit carried by the longitudinally extending member and having an inlet, a first outlet, and a second outlet spaced longitudinally from the first outlet, the first outlet being positioned to direct a process gas flow intermediate a first pair of the workpiece supports, the second outlet being positioned to direct a process gas flow intermediate a second pair of the workpiece supports.

2. The microfeature workpiece holder of claim 1 wherein each of the workpiece supports comprises a slot in the longitudinally extending member adapted to receive an edge portion of one of the microfeature workpieces.

3. The microfeature workpiece holder of claim 1 wherein the longitudinally extending member is a first longitudinally extending member, further comprising a second longitudinally extending member that includes a plurality of workpiece supports, each of the workpiece supports of the second longitudinally extending member being positioned relative to a workpiece support of the first longitudinally extending member to cooperatively support one of the microfeature workpieces.

4. The microfeature workpiece holder of claim 1 wherein the longitudinally extending member is a first longitudinally extending member and the gas

delivery conduit is a first gas delivery conduit, further comprising a second longitudinally extending member and a second gas delivery conduit carried by the second longitudinally extending member.

5. The microfeature workpiece holder of claim 1 wherein the longitudinally extending member is a first longitudinally extending member and the gas delivery conduit is a first gas delivery conduit adapted to deliver a first process gas flow, further comprising a second longitudinally extending member and a second gas delivery conduit carried by the second longitudinally extending member, the second gas delivery conduit being adapted to deliver a second process gas flow that is independent of the first process gas flow.

6. The microfeature workpiece holder of claim 1 wherein the gas delivery conduit comprises an internal lumen of the longitudinal member.

7. The microfeature workpiece holder of claim 1 wherein the longitudinally extending member is a first longitudinally extending member and the gas delivery conduit is a first gas delivery conduit that comprises an internal lumen of the first longitudinal member, further comprising a second longitudinally extending member having an internal lumen that defines a second gas delivery conduit.

8. The microfeature workpiece holder of claim 1 wherein the gas delivery conduit is formed separately from the longitudinal member and a length of the gas delivery conduit extends alongside a length of the longitudinal member.

9. The microfeature workpiece holder of claim 1 further comprising a process gas supply conduit releasably coupled to the inlet of the gas delivery conduit.

10. The microfeature workpiece holder of claim 1 wherein the each of first and second outlets of the gas delivery conduit is positioned to direct a process gas flow inwardly toward a center of one of the plurality of microfeature workpieces when the microfeature workpieces are loaded in the microfeature workpiece holder.

11. A microfeature workpiece holder adapted to hold a plurality of microfeature workpieces, comprising:

    a plurality of workpiece supports adapted to support a plurality of microfeature workpieces in a spaced-apart relationship to define a process space between pairs of adjacent microfeature workpieces; and

    a gas distributor fixed with respect to the workpiece supports, the gas distributor including an inlet and a plurality of outlets, wherein the outlets are positioned with respect to the workpiece supports to direct a flow of process gas into the process spaces.

12. The microfeature workpiece holder of claim 11 wherein each of the workpiece supports comprises a slot adapted to receive an edge portion of one of the microfeature workpieces.

13. The microfeature workpiece holder of claim 11 wherein the workpiece supports are carried by a longitudinally extending member, at least a portion of the gas distributor being carried by the longitudinally extending member.

14. The microfeature workpiece holder of claim 11 wherein the workpiece supports includes a set of first workpiece supports and a set of second workpiece supports, the set of first workpiece supports being carried by a first member and the set of second workpiece supports being carried by a second member.

15. The microfeature workpiece holder of claim 11 wherein the workpiece supports includes a plurality of first workpiece supports and a plurality of second workpiece supports, the plurality of first workpiece supports being carried by a first member and the plurality of second workpiece supports being carried by a second member, each of the second workpiece supports being positioned relative to one of the first workpiece supports to cooperatively support one of the microfeature workpieces.

16. The microfeature workpiece holder of claim 11 wherein the gas distributor includes a first gas delivery conduit and a second gas delivery conduit, and wherein the inlet is a first inlet in fluid communication with the first gas delivery conduit, further comprising a second inlet in fluid communication with the second gas delivery conduit.

17. The microfeature workpiece holder of claim 16 wherein the first gas delivery conduit is adapted to deliver a first process gas flow and the second gas delivery conduit is adapted to deliver a second process gas flow that is independent of the first process gas flow.

18. The microfeature workpiece holder of claim 11 wherein the workpiece supports are carried by a longitudinally extending member and at least a portion of the gas distributor is formed integrally with the longitudinally extending member.

19. The microfeature workpiece holder of claim 11 wherein the workpiece supports are carried by a longitudinally extending member and the gas distributor includes a gas delivery conduit having a length that extends alongside a length of the longitudinal member.

20. The microfeature workpiece holder of claim 11 further comprising a process gas supply conduit releasably coupled to the inlet of the gas delivery conduit.

21. The microfeature workpiece holder of claim 11 wherein each of the outlets is positioned to direct the flow of process gas inwardly toward a center of one of the plurality of microfeature workpieces when the microfeature workpieces are loaded in the microfeature workpiece holder.

22. A microfeature workpiece holder adapted to hold a plurality of microfeature workpieces, comprising:

a first member having a plurality of first workpiece supports spaced along a length of the first member, a plurality of outlets spaced along the length of the first member, and an internal lumen coupling an inlet to each of the outlets, wherein each of the outlets is disposed between two adjacent workpiece supports;

a second member having a plurality of second workpiece supports spaced along a length of the second member, each of the second workpiece supports being positioned relative to one of the first workpiece supports to cooperatively support a workpiece;

and at least one cross-member joined to the first and second members.

23. The microfeature workpiece holder of claim 22 wherein each of the first and second workpiece supports comprises a slot adapted to receive an edge portion of one of the microfeature workpieces.

24. The microfeature workpiece holder of claim 22 wherein the second member includes a plurality of second member outlets spaced along a length of the second member, and an internal lumen coupling a second member inlet to each of the a second member outlets.

25. The microfeature workpiece holder of claim 22 further comprising a process gas supply conduit releasably coupled to the inlet.

26. The microfeature workpiece holder of claim 22 wherein the each of the outlets is positioned to direct a process gas flow inwardly toward a center of one of the plurality of microfeature workpieces when the microfeature workpieces are loaded in the microfeature workpiece holder.

27. A microfeature workpiece holder adapted to hold a plurality of microfeature workpieces, comprising:

workpiece support means for supporting a plurality of microfeature workpieces in a spaced-apart relationship to define a process space between each pair of adjacent microfeature workpieces; and

a gas distributor means adjacent to the workpiece support means, the gas distributor means including a plurality of outlets, each of the outlets being positioned to direct a flow of process gas into one of the process spaces.

28. A microfeature workpiece processing system, comprising:

an enclosure defining a process chamber;

a removable microfeature workpiece holder disposed in the processing chamber, the microfeature workpiece holder including:

a plurality of workpiece supports adapted to support a plurality of microfeature workpieces in a spaced-apart relationship to define a process space adjacent a surface of each microfeature workpiece; and

a gas distributor including an inlet and a plurality of outlets, each of the outlets being positioned to direct a flow of process gas into one of the process spaces; and

a process gas supply conduit coupled to the inlet of the gas distributor of the microfeature workpiece holder.

29. The microfeature workpiece processing system of claim 28 wherein the gas distributor includes a first conduit and a second conduit spaced from the first

conduit, each of the first and second conduits extending longitudinally adjacent the process spaces.

30. The microfeature workpiece processing system of claim 28 wherein the inlet comprises a first inlet and the gas distributor includes a first conduit and a second conduit spaced from the first conduit, and wherein the microfeature workpiece holder further comprises a second inlet, the first conduit being in fluid communication with the first inlet and the second conduit being in fluid communication with the second inlet.

31. The microfeature workpiece processing system of claim 28 wherein the process gas supply conduit is a first process gas supply conduit, further comprising a second gas supply conduit coupled to a second gas delivery outlet, the second gas delivery outlet being adapted to deliver a flow of gas in a direction transverse to a direction of the flow of gas from the gas distributor outlets.

32. The microfeature workpiece processing system of claim 28 wherein the workpiece holder includes a longitudinally extending member that carries at least some of the workpiece supports, the gas distributor comprising an internal lumen of the longitudinally extending member.

33. The microfeature workpiece processing system of claim 28 wherein each of the workpiece supports comprises a slot adapted to receive an edge portion of one of the microfeature workpieces.

34. The microfeature workpiece processing system of claim 28 wherein the workpiece supports are carried by a longitudinally extending member, at least a portion of the gas distributor being carried by the longitudinally extending member.

35. The microfeature workpiece processing system of claim 28 wherein the workpiece supports are carried by a longitudinally extending member and at least a portion of the gas distributor is an internal lumen of the longitudinally extending member.

36. The microfeature workpiece processing system of claim 28 wherein the workpiece supports are carried by a longitudinally extending member and the gas distributor includes a gas delivery conduit having a length that extends alongside a length of the longitudinal member.

37. The microfeature workpiece processing system of claim 28 wherein each of the outlets is positioned to direct the flow of process gas inwardly toward a center of one of the plurality of microfeature workpieces when the microfeature workpieces are loaded in the microfeature workpiece holder.

38. A microfeature workpiece processing system, comprising:
an enclosure defining a process chamber;
a removable microfeature workpiece holder disposed in the processing chamber, the microfeature workpiece holder including:
a longitudinally extending member having a plurality of workpiece supports spaced longitudinally along a length of the longitudinally extending member, the wafer supports being adapted to support the plurality of microfeature workpieces in a spaced-apart relationship for processing; and
a longitudinally extending gas delivery conduit carried by the longitudinally extending member and having an inlet, a first outlet, and a second outlet spaced longitudinally from the first outlet, the first outlet being positioned to direct a process gas flow intermediate a first pair of the wafer supports, the second outlet being positioned to direct a process gas flow intermediate a second pair of the wafer supports; and

a process gas supply conduit coupled to the inlet of the gas distributor of the microfeature workpiece holder.

39. The microfeature workpiece processing system of claim 38 wherein each of the workpiece supports comprises a slot in the longitudinally extending member adapted to receive an edge portion of one of the microfeature workpieces.

40. The microfeature workpiece processing system of claim 38 wherein the longitudinally extending member is a first longitudinally extending member and the gas delivery conduit is a first gas delivery conduit, and wherein the microfeature workpiece holder further comprises a second longitudinally extending member and a second gas delivery conduit carried by the second longitudinally extending member.

41. The microfeature workpiece processing system of claim 38 wherein the gas delivery conduit comprises an internal lumen of the longitudinal member.

42. The microfeature workpiece processing system of claim 38 wherein the gas delivery conduit is formed separately from the longitudinal member and a length of the gas delivery conduit extends alongside a length of the longitudinal member.

43. The microfeature workpiece processing system of claim 38 wherein the each of first and second outlets of the gas delivery conduit is positioned to direct a process gas flow inwardly toward a center of one of the plurality of microfeature workpieces when the microfeature workpieces are loaded in the microfeature workpiece holder.

44. A method of processing microfeature workpieces, comprising:

positioning a microfeature workpiece holder in a process chamber, the microfeature workpiece holder supporting first, second and third microfeature workpieces in a spaced-apart relationship to define a first process space between the first and second microfeature workpieces and define a second process space between the second and third microfeature workpieces;

delivering a first process gas to the microfeature workpiece holder, the microfeature workpiece holder carrying a gas distributor that delivers a first flow of the first process gas transversely into the first process space and delivers a second flow of the first process gas transversely into the second process space;

delivering a second process gas to the process chamber; and

removing the microfeature workpiece holder and the microfeature workpieces from the process chamber.

45. The method of claim 44 positioning the microfeature workpiece holder in the process chamber comprises placing the microfeature workpiece holder in an enclosure and substantially sealing the enclosure to define the process chamber.

46. The method of claim 44 wherein delivering the second process gas to the process chamber comprises delivering the second process gas directly to the process chamber through a delivery conduit independent of the gas distributor.

47. The method of claim 44 wherein delivering the second process gas to the process chamber comprises delivering the second process gas to the microfeature workpiece holder and delivering a first flow of the second process gas transversely into the first process space via the gas distributor and delivering a second flow of the second process gas transversely into the second process space via the gas distributor.

48. The method of claim 44 wherein the gas distributor includes a first gas delivery conduit and an independent second gas delivery conduit, and wherein delivering the first process gas to the microfeature workpiece holder comprises delivering the first process gas to the first conduit and delivering the second process gas to the process chamber comprises delivering the second process gas to the second gas delivery conduit.

49. The method of claim 48 wherein the second gas delivery conduit delivers a first flow of the second process gas transversely into the first process space and delivers a second flow of the second process gas transversely into the second process space.

50. The method of claim 44 wherein the gas distributor includes a gas delivery conduit, and wherein the first flow of the first process gas is delivered through the gas delivery conduit to a first outlet that directs the first process gas into the first process space and the second flow of the first process gas is delivered through the gas delivery conduit to a second outlet that directs the first process gas into the second process space.

51. The method of claim 50 wherein the gas distributor includes a first gas delivery conduit and a second gas delivery conduit, and wherein:

the first flow of the first process gas is delivered through the gas delivery conduit to a first outlet that directs the first process gas into the first process space;

the second flow of the first process gas is delivered through the gas delivery conduit to a second outlet that directs the first process gas into the second process space; and

delivering the second process gas to the process chamber comprises:

delivering a first flow of the second process gas through the second gas delivery conduit to a third outlet that directs the second process gas transversely into the first process space; and

delivering a second flow of the second process gas through the second gas delivery conduit to a fourth outlet that directs the second process gas transversely into the second process space.

52. A method of depositing a material on microfeature workpieces, comprising:

positioning a microfeature workpiece holder in a process chamber, the microfeature workpiece holder supporting first, second, and third microfeature workpieces in a spaced-apart relationship to define a first process space between the first and second microfeature workpieces and define a second process space between the second and third microfeature workpieces;

delivering a first precursor gas to the process chamber to deposit a quantity of the first precursor gas on a surface of each of the first, second, and third microfeature workpieces;

delivering a purge gas to the microfeature workpiece holder, the microfeature workpiece holder carrying a gas distributor that delivers a first flow of the purge gas transversely into the first process space and delivers a second flow of the purge gas transversely into the second process space;

delivering a second precursor gas to the process chamber, the second precursor gas reacting with the quantity of the first precursor gas to form a layer of material on the surfaces of the first, second, and third microfeature workpieces; and

removing the microfeature workpiece holder and the microfeature workpieces from the process chamber.